



MOT-TVS-2-COM-M

Frequency Hopping, Rolling Code Voice Scrambler for Motorola Commercial Series Mobile Radios

MOT-VPU-15-COM-M

Voice Inversion Voice Scrambler for Motorola Commercial Series Mobile Radios

Manual Revision: 2014-05-19

Covers Software Revisions:

MOT-COM: 2.95 and Higher

Covers Hardware Revisions:

MOT-COM: 7348D and Higher

This manual supports the following Midian scramblers:

MOT-TVS-2-COM-M & MOT-VPU-15-COM-M

This manual supports the following radios:

North America: CM-300, PM-400 (4-key version)

EMEA Region: CM-160, CM-360

Asia: GM-3688

Latin America: EM-400

SPECIFICATIONS

Operating Voltage	3.3 VDC
Operating Current	8 mA
Operating Temperature	-30 - +60 C
Frequency Response	300-2100 Hz
Input Impedance	≥200 kΩ
Carrier Suppression	60 dB < Peak Voice
Audio Output Impedance	≤75 Ω
Tone Distortion	<1%

Encryption Specifications

TVS-2: Encryption Sequences	+40 Trillion
TVS-2: Random Number Generator	64 bits
TVS-2: Sequence Length (est.)	84 billion years

VPU-15: Inversion Codes Available	37
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GENERAL INFORMATION

The MOT-TVS-2-COM series is a high-level rolling code scrambler that plugs into the Motorola Commercial series radios. The TVS-2 uses hopping type rolling code encryption for higher security rather than sweeping code type and offers 4 user-programmable hop rates and is down gradable to voice inversion. The scrambler is capable of features such as ANI, ENI, OTAR, Deadbeat Disable, Spy, and more when using Midian's Kryptic Signaling format with the CAD-300/DDU-300/TRC-300.

The MOT-VPU-15-COM series is an entry level voice inversion scrambler that plugs into the Motorola Commercial series radios. The scrambler is capable of features such as ANI, ENI, OTAR, Deadbeat Disable, Spy, and more when using Midian's Kryptic Signaling format with the CAD-300/DDU-300/TRC-300.

For more detailed information on the scramblers' features, troubleshooting and system information please reference the TVS-2 Technical Reference Manual.

INSTALLATION OVERVIEW

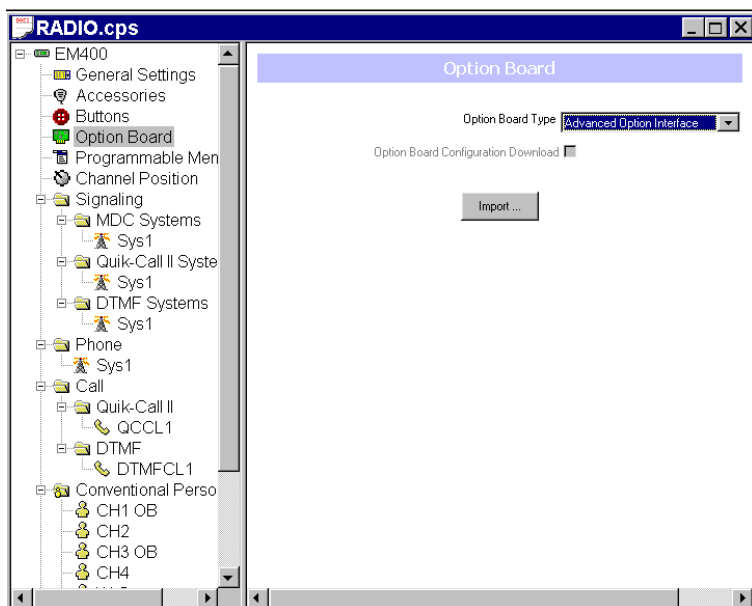
1. Test the radio for functionality.
2. Program the radio per the Radio Programming Section of this manual.
3. Install the scrambler into the radio per the Hardware Installation Section of this manual.
4. Program the scrambler per the Product Programming Section of this manual.

Note: Midian is not responsible for any damage/loss resulting from the use of Midian's products.

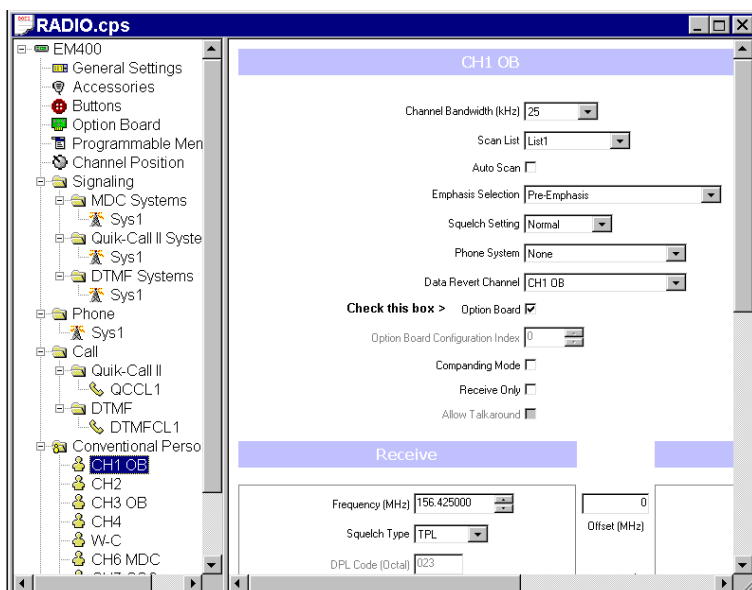
MOT-TVS-2-COM-M & MOT-VPU-15-COM-M CM-160, CM-300, EM-400, GM-3688, PM-400 Programming Instructions

It is necessary to program the radio before installing the scrambler. This is because the **Option Board Feature** of the radio must be enabled in order to program the scrambler using a RIB box and to hear confirmation beeps from the radio after programming the scrambler.

1. Upon starting the CPS programmer, click on View->Expert.
2. In the Option Board Window select "Advanced Option Interface" as the "Option Board Type".



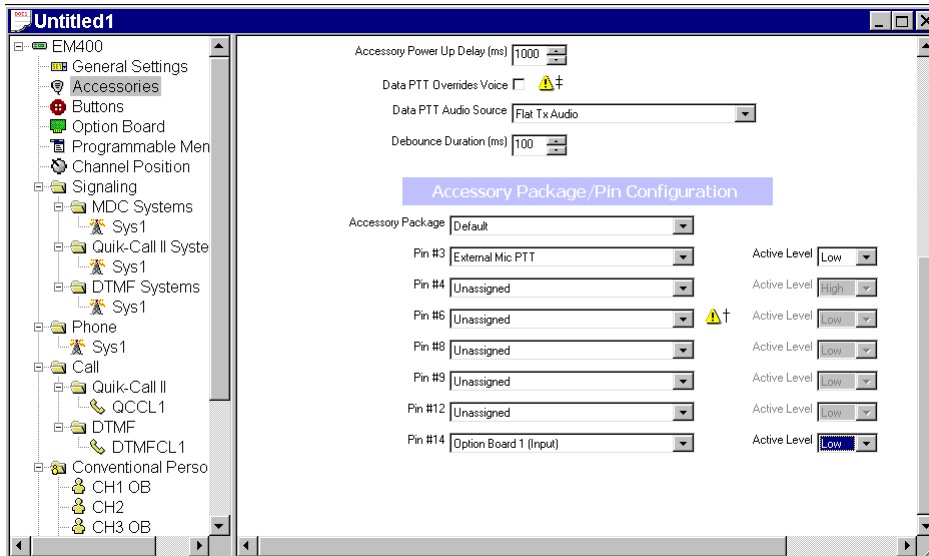
3. For each personality where scrambler functionality is desired, the **Option Board** box must be checked. You may wish to enable the option board on some or all personalities. This depends on how the scrambling feature will be controlled. This is explained in more detail in the next section.



The following two steps apply to the accessory connector and may be skipped by most users.

4. An accessory pin may be used to control the transmit mode of the scrambler between scramble and clear. This is useful in remote control applications. To enable this feature, one of the radio accessory pins must be assigned to **Option Board 1 (Input)** via the CPS programmer.
5. An accessory pin may be used to initiate an emergency ANI. This allows for an external emergency foot switch or button, and frees-up one of the radio front buttons. To enable this feature, one of the radio accessory pins must be assigned to **Option Board 2 (Input)** via the CPS programmer. The switch must be held in the active state for about 2 seconds before an emergency ANI will be sent.

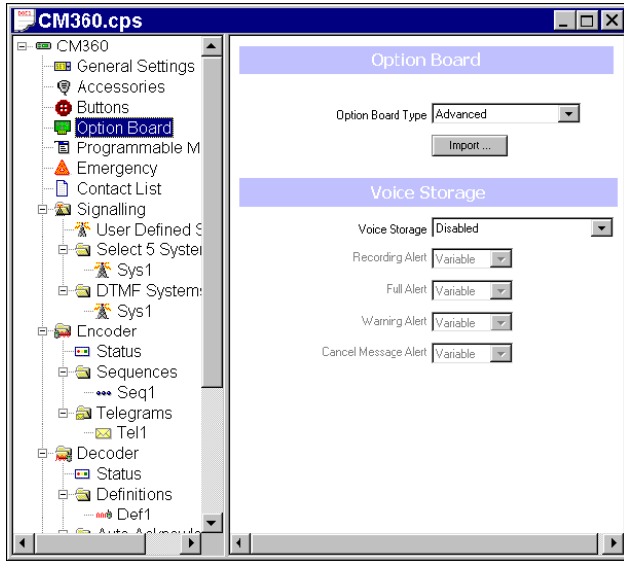
Note: Accessory pin features do not require any special scrambler programming.



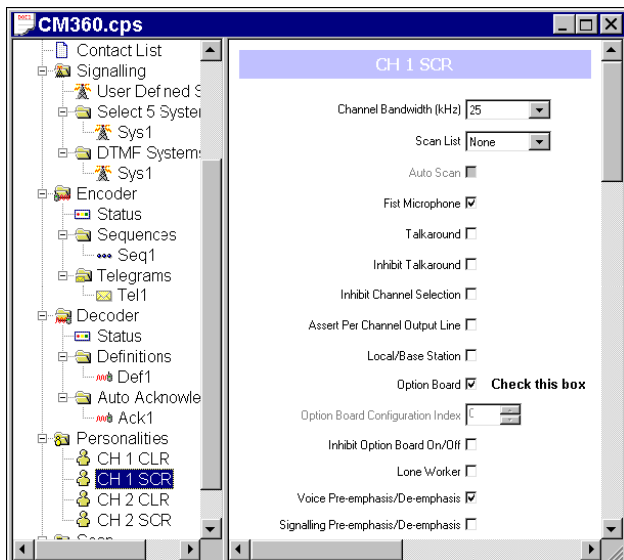
MOT-TVS-2-COM-M & MOT-VPU-15-COM-M CM-360 Programming Instructions

It is necessary to program the radio before installing the scrambler. This is because the **Option Board Feature** of the radio must be enabled in order to program the scrambler using a RIB box and to hear confirmation beeps from the radio after programming the scrambler.

1. Upon starting the CPS programmer, click on View->Expert.
2. In the Option Board Window select "Advanced" as the "Option Board Type".



3. For each personality where scrambler functionality is desired, the **Option Board** box must be checked. You may wish to enable the option board on some or all personalities. This will depend on how the scrambling feature will be controlled. This is explained in more detail in the next section.



HARDWARE INSTALLATION

Be certain to follow standard anti-static procedures when handling any of Midian's products.

Radio Firmware: Before installing the scrambler, check the radio firmware version. This is determined by reading the radio using the CPS. The scrambler has been tested with radio firmware versions R03.00.03 and R03.00.04. If the radio has an older version, it may need to be upgraded to ensure proper operation with the scrambler.

Disassembling the Radio:

Please consult the booklet included with the option board installation kit COM Option B (Motorola P/N PMLN4623A) for illustrations and more detailed installation instructions.

Equipment required:

Small flat blade screwdriver (4 mm maximum).

Torx style screwdriver, size T-10.

Small Phillips screwdriver.

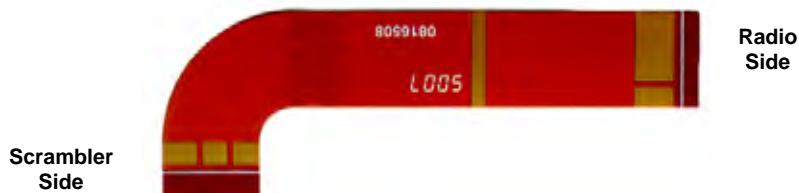
1. Disconnect power.
2. Use a flat blade screwdriver to pry the volume control knob away from the front cover. This is best done from the bottom of the knob. Pull off the volume control knob.
3. Locate the two notches on the bottom which keep the control head in place. Use a flat blade screwdriver to pry the control head away from the chassis.
4. Carefully separate the control head from the chassis and remove the flat cable connecting the two from the chassis.
5. Use a flat blade screwdriver to pry the sides of the plastic cover away from the T-shaped mounting bosses on the sides of the radio.
6. Use a flat blade screwdriver to pry the plastic cover away from the tab on the back of the radio.
7. Remove the plastic cover.
8. Insert a flat blade screwdriver into the gap between the main shield and chassis near the speaker cutout area to lift the main shield from the chassis.

Installing the Scrambler:

1. The scrambler is installed in the radio using the COM Option B (Motorola P/N PMLN4623A). The COM Option B includes 4 metal stand-offs, 4 screws and a 28-pin flex cable.
2. Remove the 3 screws located in the option board area and replace the 3 screws with the 3 of the stand-offs provided with the option board installation kit.



3. Connect the curved end of the flex cable to the scrambler board making sure the silver contact pads face the scrambler board.



4. Connect the other end of the flex cable to the option board connector in the radio, making sure the silver contact pads face the circuit board.



5. Place the scrambler board on top of the spacers with the component side facing down.
6. Secure the board using the 3 screws provided in the installation kit.



Reassembling the Radio:

1. Replace the main shield.
2. Replace the plastic cover.
3. Re-connect the control head cable to the chassis.
4. Replace the control head.
5. Replace the volume control knob.

HARDWARE ALIGNMENT

The MOT-TVS-2-COM-M & MOT-VPU-15-COM-M do not require any hardware adjustments or alignments, as Midian has preset the levels at the factory.

PRODUCT PROGRAMMING

Install the MPS software if you have not done so already. The MOT-TVS-2-COM & MOT-VPU-15-COM series is programmable through the radio using the radio programming cables and the MPS software.

Start the MPS software. From the product selection screen on the MPS software, locate and select MOT-TVS-2-PRO or MOT-VPU-15-PRO and the desired model and click OK. The following table shows the proper MPS selection based upon the model scrambler ordered.

PRO-M (MDC Mobile)	MOT-TVS-2-COM-M or MOT-VPU-15-COM-M
PRO-ME (5-Tone or MPT Mobile)	MOT-TVS-2-COM-M, MOT-VPU-15-COM-M for CM-360

PRO-E (5-Tone Portable)
 PRO-EL (Entry Level Portable)
 PRO (LTR Portable)
 PRO-M (LTR Mobile)
 PRO-M (MDC Mobile)
 PRO (MDC Portable)
 PRO-ME (5 Tone or MPT Mobile)
 PRO-XP
 PRO-XS

Configure the programming software by selecting File->Preferences. Select the appropriate COM port. If using the RIB box, make certain there is a check mark next to 'Rib Box Enable' by clicking on it.

Set the parameters of the software to fit the application. If any clarifications on a feature are required, move the mouse cursor over the feature name until the question mark appears and right click, an on-line help for that feature will be shown. On the radio tab it is necessary to select the proper Radio Model. If the correct product was selected in the step above then it will be preset in the default file. The following table indicates the proper Radio Model Selection for the scrambler ordered:

(A) MDC/LTR Mobile	MOT-TVS-2-COM-M, MOT-VPU-15-COM-M
(6) 5-Tone or MPT Mobile	MOT-TVS-2-COM-M, MOT-VPU-15-COM-M for CM-360



After entering the parameters, save the file by going to File - Save As. Enter the file name in the File Name block and click Save. Saving the file will allow for quick and easy reprogramming of units. Turn power on to the radio and then the RIB. Click ProgramUnit! in the MPS software. You will hear 1-3 beeps from the radio if programmed successfully.

To read the parameters from the scrambler, Click on ReadUnit!.

The radio and RIB should be powered down for 3 seconds after reading or programming.

Important Note: Do not attempt to 'clone' the scrambler by reading one and then programming another. When the scrambler is read, the security codes will be read out as zeroes. If another scrambler is then cloned with this information, the scramblers will be incompatible because they have different security codes. To ensure scramblers communicate with each other, program them from a saved *file*.

Option Board Feature: Enabling the option board feature tells the radio to report events such as button press, PTT press, carrier detect, etc. to the option board. This feature enables communication between the option board and the radio.

When controlling the scrambler with a radio button, it is absolutely required to enable this feature on all channels. For scrambling on a per channel basis only enable the option board on scrambled channels and the power up mode of the scrambler should be Scramble. On display models, the following icon appears on the LCD when option board mode is on:



Mode Selection: Mode selection means a method of turning the scrambler on and off. In the MOT-TVS-2-COM and MOT-VPU-15-COM series there are three ways of doing this:

Per-Channel Scramble On/Off: To use this feature each channel that is designated as a Scrambled channel should have the Option Board Feature box enabled in the radio programming software. Channels that are designated as Clear should NOT have the Option Board feature box enabled. Additionally the Power-Up State in the MPS software should be set to Scramble. When using Per-Channel Scrambling, a button should NOT be programmed for Mode Select in the MPS software.

Option Board On/Off Button: The scrambling function may also be controlled by assigning a button to “Option Board” via the CPS programmer. This button may then be used to turn the scrambler on and off. This mode of operation requires that the Power-up Mode of the scrambler be set to Scramble.

For the two above modes, the option board icon is displayed when scrambling is enabled. When the icon is not displayed, the scrambler board is completely disabled. It cannot decode scrambled audio, nor can it respond to commands from a CAD-300 or DDU-300.



Scramble On/Off Button: To use this feature each channel should have the Option Board Feature box enabled in the radio programming software. The desired button should be programmed to no function in the radio programming software. In the MPS software on the Radio tab in the Button Assignment area set the desired button to “Mode Select”. Pressing and releasing this button will toggle the mode of the scrambler between scramble and clear. A medium tone followed by a high tone indicates the scrambler is in Scramble mode and a medium tone followed by a low tone indicates the scrambler is in Clear mode.

Code Selection: The TVS-2 or VPU-15 can have up to 4 different codes programmed.

Code Selection Button: To use this feature multiple security codes must be programmed into the TVS-2 or VPU-15 scrambler. The desired button should be programmed to no function in the radio programming software. In the MPS software on the Radio tab in the Button Assignment area set the desired button to “Code Select”. Pressing and releasing this button will step the scrambler to the next security code. The scrambler will emit a number of beeps corresponding to the code number the scrambler stepped to (i.e. 2 beeps equals security code 2). The maximum number of codes is 4.

TECHNICAL NOTES

Radio Compatibility: Midian has taken the utmost care to ensure the option board integrates into the radio with minimal impact to the features of the radio. However, some features may not be available in the radio when an option board is used. If a feature is not available, please contact Midian to see if the feature can be added.

Radio Firmware: Midian recommends having the latest firmware in the radio when installing the scrambler. However, it should be noted that occasionally firmware updates may cause a conflict with proper option board/radio communications. This may appear that the scrambler is not working properly, but it is a conflict in the serial communication between the option board and radio. If this happens it will be necessary to go back to the original firmware revision. Please note that firmware versions between the EMEA region and the Asia and America regions might be different.

Scan: Midian strongly recommends not using the radio's Scan function when using voice scramblers. First of all synchronization packets will most likely not be decoded by the receiving radios, as the receiving radio may be looking at a different channel when sync is transmitted. Additionally if using a combination of scrambling on a per-channel basis and a mode select button to control the state of the scrambler, when the scan function is used the radio will ignore the button. This is best resolved by using per-channel scrambling OR a mode select button, but not both. If using scan and a mode-select button the Option Board Feature box in the radio programming section must be enabled on all channels.

Known Issues:

1. The radio must be off for a full 3 seconds prior to being turned on or the scrambler cannot reset properly resulting in malfunction.
2. The "Enable LCD Message" option in the MPS software should not be enabled due to problems in the radio. It will cause the backlight to turn off when the mode/code is displayed and all of the icons will disappear.
3. Not all button assignments available via the MPS software work with this radio. The "Combo (press & hold)" and "Emerg (press & hold)" are not supported on the P1, P2, and P3 buttons when using Enhanced Integration. Only those assignments listed below are valid:

No Function ▪ Mode Select ▪ Combo ▪ Code Select ▪ Emergency
Emergency (press & hold) (on P3 long press only)

When assigning buttons to the scrambler via the MPS software, the actual assignments vary from what is selected on the screen. Please refer to the following list, which shows the actual assignment that will take place for each possible selection:

SELECTED BUTTON	ACTUAL BUTTON
P1	P2 short press
P2	P2 long press
P3	P3 short press
P4	P3 long press

4. The "Enable Wired PTT" function on the "Radio" screen of the MPS software is obsolete. This box should never be checked.
5. Use of the System Scan feature of the radio has been known to cause a problem whereby the transmitter stays on the air 3 seconds after PTT is released. Checking the "Reserved Function" box on the "Advanced" screen of the MPS software works around this radio problem.
6. Upon power-up, the radio does not always report the state of the accessory pins to the option board. It may be necessary to toggle the state of these inputs once after power-up to ensure correct operation.

MIDIAN CONTACT INFORMATION

MIDIAN ELECTRONICS, INC.

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Tucson, Arizona 85713 USA

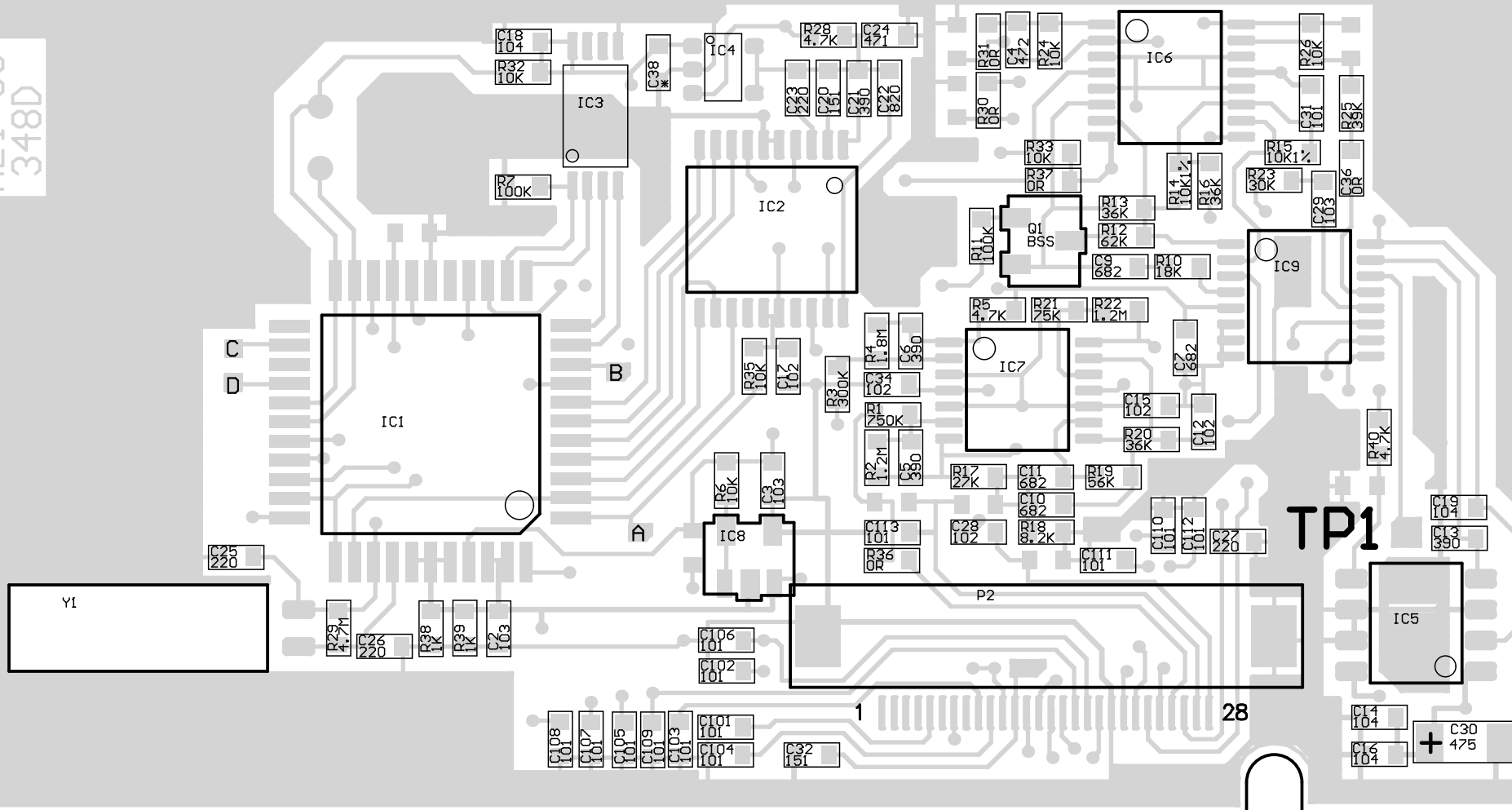
Toll-Free: 1-800-MIDIANS

Main: 520-884-7981

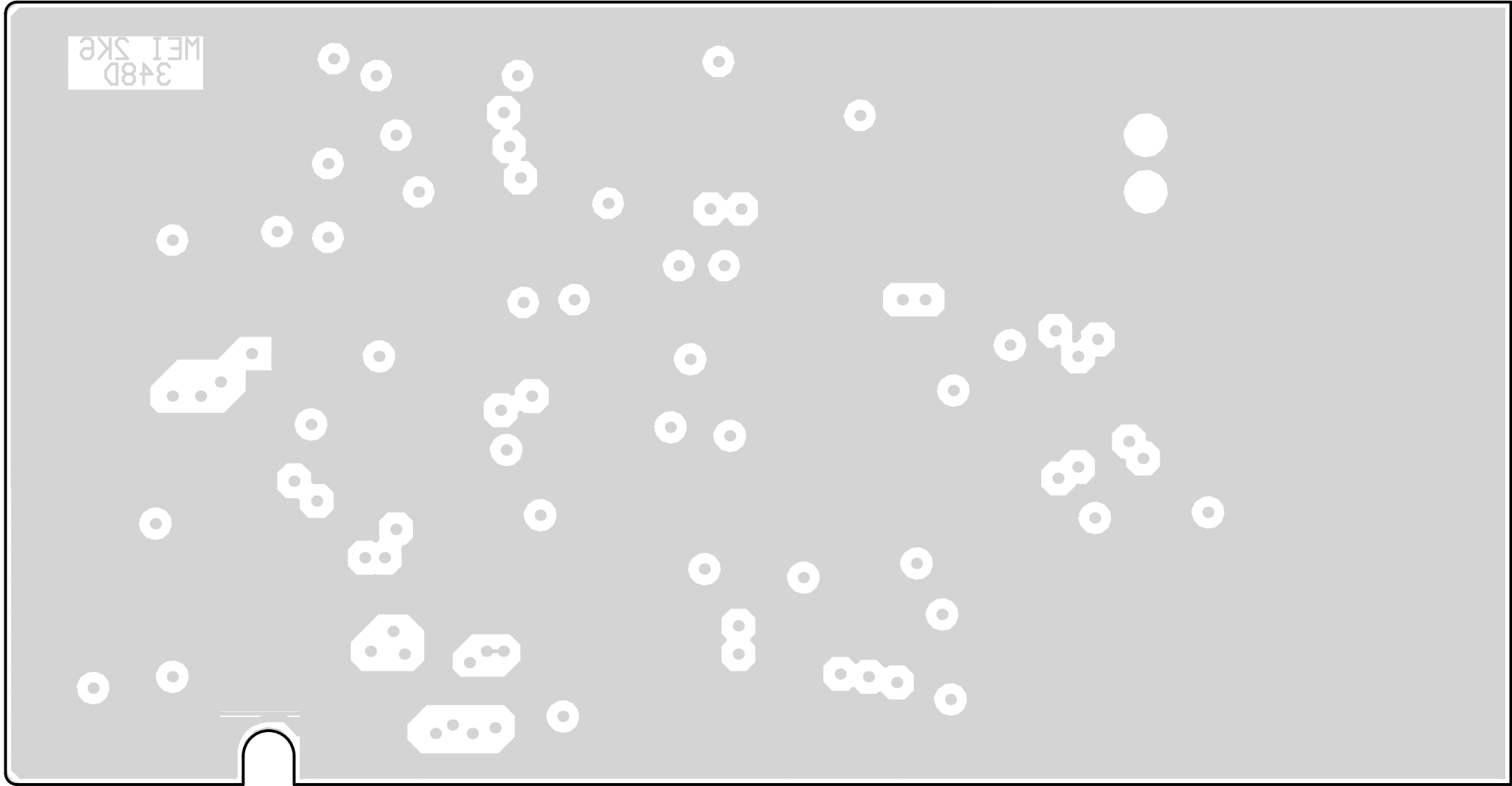
E-mail: sales@midians.com

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